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Comparative study of different oral iron preparations in Gynecological and postnatal patients

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Abstract
This study is comparison of different oral iron preparations in females of reproductive age group attending obstetrics and gynecological department as postnatal and gynecological cases. Aim of the study is to identify the target group for correction of anemia in reproductive age group as this will ensure lesser number of anemic females entering state of pregnancy, hence lower maternal and fetal/neonatal morbidity and mortality due to anemia in pregnancy. Because of altered physiology in pregnancy, diagnosis and treatment of anemia poses a challenge, whereas improved hemoglobin and iron storage before conception will ensure better maternal and fetal outcomes. Postnatal patients have better results of oral iron intake and higher compliance for oral iron preparations than gynecological patients. Ferrous ascorbate showed maximum improvement in hemoglobin and serum ferritin levels after 3 months of treatment among 5 different oral iron preparations in postnatal and gynecological cases.

Keywords: Iron deficiency anemia, gynecological patients, postnatal patients, serum ferritin, hemoglobin, compliance

Introduction
Iron deficiency anemia is known to be among the commonest nutritional anemia worldwide. Although countries with malnutrition like India have high prevalence of iron-deficiency anemia (50%-80%), iron-deficiency states without anemia are frequently found in countries with normal nutrition (prevalence up to 20%).[1] Women naturally have a much higher prevalence of iron deficiency than do men. The reason for this is regular blood or iron loss during menstruation with concomitant insufficient intake.[2,3] Gynecological causes of iron deficiency include recurrent hypermenorrhea, menorrhagia, or metrorrhagia due to adenomyosis, uterine fibroids, or endometrial hyperplasia. They all come under the heading of heavy uterine or menstrual bleeding. Foods high in iron, such as meat, contain up to 2 mg/100 mg, but absorption in the intestine ranges from 1% to 20%, depending on whether the food is of animal or vegetable origin. Therefore, compensating for higher iron losses through diet is unrealistic with existing eating habits and quantities.[4] improving hemoglobin levels in females of reproductive age group will ensure that healthier females enter the pregnancy, hence better maternal and fetal outcome. This study will help to identify the catchment population for improving anemia in pregnancy and also underlines the iron preparation with better outcomes.

Materials and Methods
Subjects: gynecological patients (150) attending OPD and postnatal cases (250) delivered in our hospital having hemoglobin 7-10g/dl were included in the study which were randomly allocated into 5 groups: group 1, 2, 3, 4 & 5 according to the oral iron preparation given. Group 1 is ferrous sulphate - sustained release (approximately 50mg elemental iron- twice daily), group 2 is ferrous fumarate (98.6mg elemental iron- once daily), group 3 is ferrous ascorbate (100mg elemental iron-once daily), group 4 is colloidal iron(50mg/ml of elemental iron) & group 5 is ferric ammonium citrate suspension(32.8mg/15ml of elemental iron).The patients asked to follow up after one week (7 days) and then after 1, 2, 3 months (30, 60, 90 days). The blood sample taken Hb at day 0 to know baseline values and then at the end of first and third month. Serum ferritin was assessed at day 0 and at the end of third month. Measurement of serum ferritin has the highest sensitivity and specificity for diagnosis of iron deficiency anemia and iron storage. During each follow up visit compliance was checked.

Results and Discussion

Table 1: Comparative evaluation of different iron preparation groups after 3 months of therapy in postnatal and Gynecological patients

Groups	Iron preparations	Tablet/ syrup	Postnatal			Gynecological		
			Mean rise in hb on d30	Mean rise in hb on d90	Mean rise in serum ferritin	Mean rise in hb on d30	Mean rise in hb on d90	Mean rise in serum ferritin
1	Ferrous sulphate SR hosp suppl	Tablet	1.55 ± 0.48	2.96 ± 0.88	30.20 ± 14.33	0.75 ± 0.21	2.31 ± 1.33	10.95 ± 1.64
2	Ferrous fumarate	Tablet	1.14 ± 0.37	2.68 ± 0.27	24.82 ± 12.40	1.05 ± 0.29	3.00 ± 0.48	14.29 ± 2.84
3	Ferrous ascorbate	Tablet	1.90 ± 0.63	3.41 ± 0.83	33.61 ± 10.16	2.75 ± 0.57	4.53 ± 0.70	39.32 ± 11.74
4	Colloidal iron	Syrup	2.34 ± 0.85	3.10 ± 0.87	28.79 ± 10.11	2.20 ± 0.56	3.88 ± 0.85	30.43 ± 11.67
5	Ferric ammonium citrate	Syrup	1.73 ± 0.82	2.47 ± 0.77	20.20 ± 8.70	18.94 ± 6.81	1.74 ± 0.37	10.69 ± 2.33

Table 2: Comparative evaluation of Gynecological and postnatal patients in different iron preparation groups in terms of drop outs and continued follow up during study

Groups	Iron preparations	Tablet/ syrup	Postnatal			Gynecological		
			Day 1	Day 90	Drop outs	Day 1	Day 90	Drop outs
1	Ferrous sulphate sr(hosp supply)	Tablet	50	37	13	30	15	15
2	Ferrous fumarate	Tablet	50	39	11	30	20	10
3	Ferrous ascorbate	Tablet	50	40	10	30	22	8
4	Colloidal iron	Syrup	50	39	11	30	22	8
5	Ferric ammonium citrate	Syrup	50	44	6	30	26	4
Total			250	99	51	150	99	45

On intergroup comparison it was found that maximum rise in hemoglobin on day 30 was with tablet ferrous ascorbate. Rise in hemoglobin level was higher in postanatal group than gynecological patients. Savita Rani Singhal *et al*. (2015) [5] concluded in their study that ferrous ascorbate and ferrous bis-glycinate are more effective than ferrous sulphate. Smita Sagaonkar *et al*. (2009) [6], in their study found more rise in Hb with ferrous fumarate than carbonyl iron. Agarwal and Rathi (2006) [7], conducted a comparative study to compare the efficacy of ferrous ascorbate and carbonyl iron and showed that ferrous ascorbate resulted in significantly higher increase in hemoglobin as compared to carbonyl iron.

On intergroup comparison it was found that maximum rise in hemoglobin on day 90 was with tablet ferrous ascorbate. Rise in hemoglobin level was higher in postanatal group than gynecological patients. Pavan Jagdishbhai Panchal *et al*. (2015) [8] found more rise in Hb with ferrous ascorbate than ferrous sulphate in their study.

In our study, in postnatal group, the mean rise in serum ferritin was found maximum with ferrous ascorbate and minimum with ferric ammonium citrate. In gynecological patients by the end of 90 days of iron therapy, rise in serum ferritin was significant in all the groups, which was maximum with ferrous ascorbate and minimum with ferric ammonium citrate. Savita Rani Singhal *et al*. (2015) [5] found the rise in serum ferritin level was more in ferrous ascorbate and ferrous bis-glycinate than ferrous fumarate and ferrous sulphate in their study. S.S. Patil *et al*. (2013) [9] found an effectively increased serum ferritin level with ferrous fumarate. Pineda *et al*. (2001) [10] showed significant rise in serum ferritin with 60mg and 120 mg of iron from ferrous bis-glycinate and with 120 mg of iron from ferrous sulphate and not with ferrous bis-glycinate containing 30mg of iron. Sarkate *et al*. (2007) [11] also found comparable rise in serum ferritin with 33 mg iron from sodium feredetate and 100 mg of iron from ferrous fumarate.

In our study, the total number of patients at day 1 was 250 in postnatal group and 150 in gynecological group and they were taken for study of hematological parameters and serum ferritin levels. Maximum number of drop out occurred at day 90 and higher percentage in gynecological patients than postnatal group. The number of drop out in ferrous sulphate of hospital supply was maximum due to side effect in the patients and minimum with syrup ferric ammonium citrate because of less side effect.

Conclusion

Both gynecological and postnatal patients in our study showed significant improvement in hematological parameters, where effects of iron supplementation is better in postnatal patients due to higher compliance and lower dropout rate in postnatal patients. Side effects are lesser and compliance is better in postnatal group. Thus, postnatal patients provide a better catchment population for correction of anemia in reproductive age group.

In our study ferrous ascorbate tablet was most efficacious of all the tablet forms and colloidal iron was most efficacious of two suspension forms due to its high elemental iron. Patients were least compliant to Ferrous sulfate in spite of free availability in Government hospital because of its non-tolerable side effects, while its efficacy was comparable with other oral iron in rising hematological parameters, if taking regularly. Therefore, it is needed to introduce it as an oral iron supplement in the National Nutritional Anaemia Control Programme by Ministry of Health. Food fortication with this formulation can be a better alternative.

We conclude that postnatal patients should be the target population for correction of anemia with oral ferrous ascorbate in reproductive age group.

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